

The Doctrine of
DECIMAL ARITHMETICK,
Simple Interest, &c.

AS ALSO ³⁷⁻¹²⁻⁷⁴
Of Compound Interest

A N D
A N N U I T I E S;

Generally performed for any time of
Payment, or Rate of Interest, by help of a
particular Table of Forbearance of 1 l.
Principal, with Inlarged Rules.

Formerly abridged for portability, in a
Letter Case.

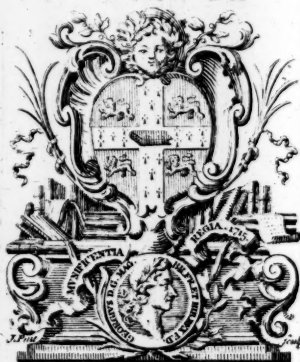
By *John Collins* Accomptant, *Philomath.*

And since his Death both made Publick
by *J. D.*

L O N D O N,
Printed by *R. Holt* for *Nath. Ponder* at the
Peacock in the *Poultry*, near the *Stocks-*
Market, 1685.

The Doctrine of
 DIOPHANTUS ARITHMETICK
 Simple Interest, &c.

A 2 V. 1. 20



And since his Death well made Publick

11: 2732

L O A D O W

Printed by R. Hall for Wm. Bond
 in the Strand near the
 Mouth of the River

The Epistle

~~John Collins's Accomplish'd Poet~~
~~and Poet of the Poet's Poet~~

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THE EPISTLE

TO THE

READER.

Courteous Reader,

IT is the accustomed way to Dedicate Books to some Honourable Person, that thereby the Book might have the greater Esteem. This Book needs no such Dedication, for the Name of the Author (which will never dye, Ingenious Mr.

The Epistle

ted at the end of the Book, whereby the Reader may see it no ways derogates from the Old Copy, and thereby may see how full and plain the New Rules are in comparison to the Old.

This Book is a fit Companion for all Gentlemen, Merchants, Scriveners, and other Trades-men, that deal much in lending of Money upon Interest, Mortgages, buying of Estates either in Fee, Copy, or Lease, holding Annuities, Rent Charges, Forbearance of Money, Discompt, or any other way concerning Interest, &c.

When any Person does perfectly understand the large Rules, he may if he pleases lay by the Book, and only use the Compendium with the Tables

to the Reader.

Tables to be carried about in a Letter
Case ; and I hope in perusing this
small Treatise the Reader will find
that which will give him Satisfaction,
both as to the Rules and Tables.

Yours, J. D.

Decimal

to the Reader.

Tables to be carried about in a Letter
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both as to the Rules and Tables.

Yours J. D.

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1

Addition and *Substraction* in Decimals is the same, as in whole Numbers, keeping the place of Units just under each other.

Multiplication in Decimals is the same, as in *Common Arithmetick*, saving as many Decimal Parts as are in both Multipliers, so many must be cut off from the Product, which if it have not so many places, the Defect is to be supplied with Cyphers towards the left hand.

Division is the same as in whole Numbers, without regard to Decimals till the Work is done, and then use the Converse of the Rule for Multiplication. (*viz.*) so many Decimals as are in the Dividend, so many there must be in the Divisor and Quote, and if there be not so many, the Quotient must be supplied with Cyphers towards the left hand.

Simple

Simple Interest.

P R O P. I.

TO compute the Interest for a day, $\frac{6}{365}$ is the Interest of 100 *l.* for a Day, the $\frac{1}{100}$, whereof is the Interest of 1 *l.* for a Day (*viz.*) $\frac{6}{36500}$; Or 6 (with Cyphers put on at pleasure) divided by 36500 is ,000164383 the Interest of 1 *l.* for a Day.

Prop. 2. The Decimals of Days in the Table at the end will serve to find the amount of 1 *l.* Simple Interest of any Rate for any time under 365 Days or a Year.

If you take the Decimal for one day (or more) and multiply that by ,06. 7. 8. &c. *per Cent.* or any other Rate, the Product will give the Interest of one pound for a Day, or more

Simple Interest.

5

Prop. 2. *Forbearance of Money at Simple Interest.*

The Interest of 1 *l.* for any Number of days, at what rate of Interest you please, be first found by the first Proposition, that Product multiplied by the Sum propounded, gives the Interest thereof for the time required.

Example.

To know the Amount of 140 *l.* for 121 days, at 6 *l. per Cent.* Simple Interest.

The Decimal of 1 *l.* }
for 121 days } 1,019890410
Multiplied by 140

Which is 142 *l.* 15 *s.* 8 *d.* 40795616400
1,019890410

142,784657400

B 3

Prop. 3.

Prop. 3. *Rebate, or the Present worth of Money due hereafter.*

Find the Interest of 1 *l.* for the time given, as in *Prop. 1.* And thereto add an Unit by it. Divide any other Sum propounded, and the Quote is its present Worth.

Example.

If 142 *l.* 15 *s.* 8 *d.* be due at the end of 121 days, what is it worth in ready Money?

$$1,019890410 \overline{) 142784657400} \quad (140$$

$$1019890410 \cdot \cdot$$

$$\underline{4079561640}$$

$$\underline{4079561640}$$

$$000$$

Worth

Worth in ready Money 140 l. at
 6 l. per Cent. Simple Interest, and
 may be done for any other rate of In-
 terest, working by the first Proportion
 and this former Rule.

Prop. 4. *Equation of Payments.*

By Prop. 3. compute all the Present
 Worths, and then by Proportion. If
 all those Present Worths amounted to
 the Total of all those Payments, what
 did one pound amount to in the said
 time? From the result subtract an
 Unit, the Remainder is the Interest of
 1 l. for the time sought, which divide
 by the Interest of 1 l. for a day, the
 Quote is the Number of days sought.

If you are to Aequate an Annuity,
 at Simple Interest. I presume a Com-
 pendium may be found in *Mengolus*
 his Arithmetical Quadratures (a Book
 I never saw) who it's probable by a
 Compendium gets the fact of an A-

rithmetical Progression, and adds Fractions that have a constant Numerator, and an Arithmetical Progression for their Denominators.

So much for Simple Interest, my Design being more for the Explanation of the Tables for Compound Interest and Annuities.

Of Compound Interest.

THe Original thereof is Derived from Simple Interest, for if it be Lawful to take Interest at all, then it is as Lawful to put out the Interest-Money to Use, as the Principal.

For ease in Calculating Questions that concern Compound Interest, Arithmeticians do usually frame Tables in store, to shew what 1 *l.* Principal forborn at any Rate for any determinate

minate time shall amount unto ; the Construction whereof is by the Golden Rule, as followeth ;

As 100 *l.* Principal is to the amount thereof at the years end ;

So is an Unit. To its amount (to wit.)

So is 1. $1,06$. If 6 be the rate of Interest, then it will hold again for the next year.

As 1. $1,06$, so $1,06$, to $1,1236$, the principal and Interest at the second year.

Now because an Unit is in the first place, which doth not divide, it followeth, that the second years amount Squares the Number $1,06$, being the Quotient of $1,06$ divided by 100, and that is the amount of 1 *l.* forborn a year, the Compound Interest the third year Cubes it, &c. And the said Number $1,06$ is by Arithmeticians called the *Ratio*, *Quote* or *Denominator* of the *Ratio* propounded, and the *Logarithm*

garythm thereof multiplied by the time doth raise those Powers agreeable to the nature of *Logarythms*.

By the former Proportion was the following Table for years made, or for Abridgment by Addition, only by help of a Table of $1,05$ multiplied by all the Digits; And this raising of Powers is by some called *Involution*, and as for that of Months may be made by finding mean Proportionals, and those of days by help of the Common Logarythms, or without, supplied far enough downward, by help of mean Proportionals, and a Decimal Table for time, and three Months here is understood to be the precise $\frac{1}{4}$ of a whole year, and so of the rest.

That which we add concerning it, is, That it self is in effect no other than a Table of Logarythms, but of another kind than those in Print, yet herein agreeing therewith, that in both the Logarythm

the Logarythm of an Unit is 0, and therefore this Table may be continued for any large time by one or some few Multiplications, it is here continued to each year for 50 years, then for every 10 years to 100, whereby you may perceive that an Inheritance, or a Sum due after such a time is worth little more than a three hundred and fortieth part of its present Worth.

And in the next place it will supply the Defect of all other Tables (especially those that relate to the said rate of Interest) whether of Discount of Money or of Forbearance of and Discount of Annuities, or for the Purchase thereof.

In the Tables following the number of years are the *Logarythms* or *Indexes*, and the Amounts are the Numbers to which the Logarythms belong, and because this is no full Table of Logarythms to ten or one hundred thousand, we therefore use Multiplication

tion and Division to supply those Defects, wherefore the first *Prop.* is ;

Prop. 1. To continue the said Table.

Multiply the Numbers together that belong to any Numbers of years, that added together make the years of Continuance required.

Example.

Let it be required to find the Amount of 1 *l.* for 50 years.

20 Years	3,20713
30 Years	5,74349
<hr/>	<hr/>
50 Years	Product is 18,42015

and is the Number sought, omitting the five superfluous places of Decimals.

Another

Another Example.

It is required to find the Amount of
1 l. forborn 20 years three quarters.

20 Years is	3,20713
9 Months	1,04467
	<hr/>
<i>The Product</i>	3,25180

And the like may be done for days,
and the *Converse* when an Amount is
given, the time thereto may be found
by Division, searching in the Table
what Number amongst the Decimals
for time agrees to the Divisors and
last Quote. See *Prop. 8.* the First
Section.

And here it is worth noting, That
many Questions may be put con-
cerning Compound Interest, which
are of the like difficulty, as to raise
the printed *Logarythmetical Cannon.*

For

14 *The Amount and present Worth*

For Example such a Question may be put ;

One pound was put out at Compound Interest, and in 10 years time amounted to 10 *l.* in what space of time did it amount to 2 *l.* the answer is the Logarythm of the Number two (to wit) 3,01023 years which was not raised without much toyl, and the rate of Interest in those Logarythms is near 26 *l. per Cent.* to wit 25,89292.

The Uses of the said Table.

Prop. 2. *A Sum forborn for any time, to find to what it shall amount to at 6 l. per Cent. Compound Interest.*

Find in the Table, or Compute by
1. *Prop.* the amount of 1 *l.* for the said Time, and then it holds.

As

The Amount and present Worth. 15

As 1 *l.* is to its Amount ;

So any other Sum to its Amounts :

Wherefore the Amount of 1 *l.* must
be multiplied by the Sum proposed.

Example.

What shall 136 *l.* 15 *s.* 06 *d.* amount unto being forborn 20 years at 6 per Centum ?

The Amount of 1 <i>l.</i> for 20 years is	} 3,20713
Which multiplied by	
	136,775

The Product is 438,655

Reduced is 438 *l.* 13 *s.* 1 *d.* 4,

Prop. 3. *A Sum of Money due hereafter, to find what it is worth in ready Money.*

Find in the Table what 1 *l.* forborn, the like time shall amount unto at Compound Interest, then it holds.

As

As the said Amount is to an Unit ;
So is any Sum propounded, to its
present Worth.

Corollary. Therefore if an Unit be
the Sum whereof you would find the
present Worth, you will frame the
Numbers in the usual Table for Dis-
count, and for all other Sums: Because
an Unit doth not Multiply, it will
follow they must be divided by the A-
mount of 1 *l.* for the like time.

Discount, or the present Worth of
Money due hereafter.

*Example first, for making the Table
of Discount.*

An Unit divided by 3,20713, the
Quotient is 311804, the present Worth
of 1 *l.* due 20 years hence.

Example second.

If 400 *l.* be due 20 years hence,
what

What is it worth in ready Money, abating Compound Interest at 6 per Centum per Annum?

Divide 400 by 3,20713, the Amount of 1 l. forborn 20 years at Compound Interest, and the Quotient is 124 l. 722, or 124 l. 14 s. 5 d. $\frac{5}{8}$. And how to reduce fundry Payments, to an Equation of time at Compound Interest. See *first Example of Prop.8.*

Prop. 4. Of *Forbearance of Annuities.*
To find the Arrearages of an Annuity.

The Difference between the Forbearance of an Annuity, and of a Principal put out to Interest, is this, that every year there is a Principal like the first added.

The Proportion holds.

As, $\frac{96}{1}$ the Compound Interest of
£. for a year, is to the Amount less
Cby

by an Unit of one of one pound forborn at Compound Interest for the time proposed.

So is any Annuity or yearly payment of Rent forborn the like time, and at the same Rate, to the Arrears thereof due. And when the Rent

is payable $\left\{ \begin{array}{l} \text{Half-yearly,} \\ \text{Quarterly,} \end{array} \right.$
 the first term in the proportion must be the Compound $\left\{ \begin{array}{l} \text{Half a year,} \\ \text{Quarter,} \end{array} \right.$
 Interest of 1 £ . for accordingly, &c.

Example.

Let it be required to find what one pound a year Annuity forborn for 30 years at 6 *per Centum* shall amount to.

One pound forborn at Compound Interest so long amounts to 5, 74349 which lessened by an Unit is 4, 74349 which divided by 06, the Quotient is 79, 0581 and this is the Number found

found in the Vulgar Tables for for-
bearance of Annuities.

Second Example.

Let it be required to find what
20 *l.* Annuity forborn for 15 years
shall amount unto at 6 *per Centum*.

1 *l.* Principal forborn 15 years
amounts to 2, 39655 from which
subtracting an Unite it holds.

As, 06 to 1, 39655 so 20 to 465, 516,
that is 475 *l.* 10 *s.* 4 *d.*

Third Example.

A Quarterly Rent of 25 *l.* was re-
spited 20 $\frac{3}{4}$ years, by the first Propor-
tion the amount of 1 *l.* so long for-
born was 3, 34978. And the Interest
of one pound for a quarter is 0, 14675
Wherefore by Proportion, As, 014675
Is to 2, 34978 : So is 25 to 4003, 032
that is 4003 *l.* 00 *s.* 7 $\frac{3}{4}$ *d.*

*This Useful Proportion I thus
demonstrate which the Rea-
der may pass by.*

Imagine the Land or Stock that yields an Annuity to be such a Principal lent out for the whole term as will bring in so much yearly Interest as the Annuity comes to, then at last the whole at Compound Interest is to be repaid, whereof so much is supposed to be repaid in the Value of the Land, as its first Principal came to, and the rest in Money; wherefore out of the whole Amount of that Principal and its Interest, the Principal must be deducted unless to shun it by that which Geometers call conversion. See Commentators on 16 Def. *Quinti Euclidis* &c. we say,

As the first term is to the difference of the first and second;

So the Third Term to the difference

rence of the third and fourth.

The Plain Proportion grounded upon the former Considerations runs thus,

As 1 £ . Principal. Is to its Amount for the time forborn ;

So the Principal that shall bring in any Annuity proposed. To the Sum of the said Principal and of the Arrearages of the Annuity.

Then it will hold by conversion of Reason. As 1 £ . forborn at Compound Interest is to its Amount less by an Unit for the time forborn ;

So is the Principal of an Annuity, forborn the like time,

To the Arrearages of the Annuity.

And instead of the third term of this Proportion, we may take in a fraction equivalent thereto, the Numerator whereof is the Annuity or yearly payment of Rent, and the Denominator the Interest of 1 £ . for a year; for to find the Principal of an Annuity say,

C 3

As

As 6 is to 100. Or rather, 06 : 1.

So is the Annuity to its Principal.

And both these latter Proportions compounded into one will be the proportion first delivered, the Units in each being expunged as insignificant either in Multiplication or Division.

Prop. 5. To find the present worth of an Annuity.

If an Annuity be forborn till the last payment be due, then for as much as the Interest of each particular payment is by the former or 4th. Proposition computed, if by the 3^d. Proportion the same, together with the rebate of each payment be destroyed (to wit) the present worth of the whole Arrearage be computed it shall be the present worth of the Annuity, the Proportion in both those Propositions being after the manner of the 4th.

4th. prop. composed into one it will hold for Annual payments at 6 *per Centum*.

As the fact of (06) the Interest of 1 *l.* for a year, and of the Amount of one pound Compound Interest for the time proposed, is to the said Amount less an Unit.

So is the Annuity or yearly Rent to the present worth thereof.

Example. First for making the Tables.

To find the present worth of an Annuity of 1 *l. per Annum*, to continue 25 years at 6 *per Centum* compound Interest.

The Amount of 1 *l.* for that time is 4,29187 which Multiplied by 06 the fact is ,257512, whereby dividing 3,29187 the Quote is 12 *l.* 78335 the present worth sought.

Example. Secondly for half-yearly Payments.

An Annuity of 40 *l.* payable, 20 *l.* each half year is to be sold for 12 years at 6 per Centum.

The Compound Interest of }
1 *l.* for half a year is ——— } ,029564

The amount of 1 *l.* for- }
born 12 years ——— } 2,012196

Multiply these two together, and that added together makes the fact of both ;

Which is ——— ,058487

It therefore holds,

As ,058487 is to ,1,012196.

So is 20 to 346,166 that is 346 *l.*
3 *s.* 4*d.* the present worth thereof.

If this Annuity were paid yearly it
must

must be of less Value because the money is longer in coming in, and accordingly the worth of it $\begin{matrix} l. & s. & d. \end{matrix}$ would be but ~~—————~~ 335---7---1

Admit it were required to know what an addition of 8 years more is worth after 12 are expired.

The worth of the said Annuity for 20 years, is 458.15.11

The difference of these two is ————— 123. 8. 10 being the present worth of the 8 years sought.

Prop. 6. *To find what Annuity any Sum of ready Money shall purchase.*

This is but the Converse of the former Proposition, and it holds therefore;

As

As the Amount of 1 *l.* forborn at Compound Interest less an Unit is to the fact of ,06 and of the Amount of one pound so forborn,

So is any Sum of ready money to the Annuity it shall purchase.

In this and the two former propositions by ,06 is understood the Compound Interest of 1 *l.* for a year, and when the payment is by quarters or half years, instead thereof must be put in the Interest of a quarter or half a year. And instead of the Annuity or yearly payment, the Quarterly or Half-yearly payment accordingly.

Corollary.

If 1 *l.* be the sum of ready money then the two middle Terms of the proportion are the fact above mentioned, and you will frame the other Vulgar Table for this purpose.

Example.

Example the first.

To find what Annuity 1 *l.* shall purchase to continue 30 years, it holds;

As $4,74349$ to $,06$. So $5,74349$ to $0,07264$.

Example Second.

Let it be required to find what rent payable yearly 8 *l.* shall purchase at 6 *per Centum* to continue 21 years.

As 2,39956 the Amount less an Unit of 1 *l.* for 21 years is to ,20397 the fact of ,06 and the amount,

So is 8 to ,68 or 13 s. $7\frac{1}{4}$ d. the Annuity sought.

Memorandum, That by the Fact is meant that you should multiply the foregoing Figures by ,06. Viz. 2,39956 by ,06,

Which makes 2,2039736.

Now

Now whereas the Lease of a house of 1 *l. per Annum* to continue 21 years is commonly sold for 8 *l.* or 8 years purchase, and your money will purchase a certainty but of 13 *s.* 7 *d.* $\frac{3}{4}$ *per Annum*, you see by this supposition you are abated 6 *s.* 5 *d.* $\frac{3}{4}$ *per Annum* in the pound upon the Account of Taxes Reparations and Casualties; and very good Reason there is for great abatements, for a Tenant taking a Lease of a Timber house, if it be burnt down by a Fire beginning at his Neighbours as leases commonly Run, is bound to build it up again and hath no relief either in Law or Equity against his Landlord, as I am informed by able Council, only he hath the benefit of a Benevolence, his Action against them where the fire began (who perchance are ruined.)

	s.		s.	d.
10		will purchase an	--11--	11
10		Annuity to con-	--12--	9
10		tinue 21 years of	--14--	5½
			--15	
			--17	
1--5--3½				1-00-0

Hence it appears that the Value of Leases of Houses cannot be estimated near the Truth by the Common Tables for Annuities at the current rate of Interest, and that if any one would use them to this purpose it were much nearer the truth first to abridge the Rent as aforesaid.

Prop. 7. Any number of years in a Lease or Annuity being propounded to find the present Worth of any greater or lesser Number of years therein.

This is one of the most usual and useful Propositions of this Nature, and as

30 *The Amount and present Worth*

as propounded is not sufficiently Limited, and the Question in this Case will be, What is the most equitable rate of Interest whereby to resolve the Proposition; to find out which it is either necessary to assign how many years purchase the Fee Simple or Inheritance is worth, or the present Worth of a Lease of any Number of years therein.

I. If the Worth of the Inheritance be assigned, then thereby divide 100 the Quote shews the Annual Interest for.

Example:

Let the Fee Simple or Copy-hold Lands be worth 16 years 8 months Purchase, then dividing 100 by $16\frac{2}{3}$ the Quotient is 6, whereof 6 pound in the 100 is an equitable Rate of Interest whereby to compute the present worth of a Lease of any number of years

The Amount and present Worth. 31

years therein, and so *è contra* if money were at 8 *per Centum*, the Laws of Arithmetick allow the worth of the Inheritance of the best Land that is, to be but $12\frac{1}{2}$ years Purchase, which some would confirm, from this reason, because otherwise their money would yield a better income at Simple or Compound Interest, but the most proper Reason is derived from the Nature of a Geometrical Progression decreasing *ad Infinitum*; for instance, admit you have a Tenant in the Tenure or Possession of 1 *l. per Annum*, and you say to him, pay the rent now that will be due at the end of

$\left. \begin{array}{l} 1 \\ 2 \\ 3 \\ 4 \end{array} \right\}$ Years, &c. *ad infinitum*.

and you will rebate him after the rate of Compound Interest. I say the Total of all those Payments shall never exceed 12 *l. 10 s. 00 d.*

The

32 *The Present Worth &c.*

*The Proportion for casting up the sum
of a finite Geometrical Progression
runs thus,*

As the difference of an assumed
extreme and its next inward mean is
to the next inward mean;

So is the difference of the remote
extremes to the sum of the Progression,
except the assumed extreme.

The reason wherof is, That if a rank
of Numbers be in Geometrical Pro-
gression their sums and differences are
likewise in the same Proportion. See
35 of 9 Book of *Euclid*, or *Briggs* his
Arithmetica Logarithmica.

Example.

6, 18, 54, 162, 486,

3, 9, 27, 81, 243, 729.

Wherefore it holds by *Euclid*.

As one difference } 6

Is to its Consequent ————— 9

So

So is the Sum of all the
differences (which is here
the difference between the
first and last term) ——— } 726

To the Sum of all the Consequents
is 1089.

Wherefore the sum of the whole
progression is ——— 1092.

And supposing this Progression to
decrease infinitely, then will the first
term be 0, and the sum of all the
Pro-Differences 729, and it holds. As

$$\begin{array}{r} 186 \quad 243 \quad 729 \quad 364\frac{1}{2} \\ 729 \\ \hline 1093\frac{1}{2} \end{array}$$

Wherefore the sum of this infinite Pro-
gression is $1093\frac{1}{2}$, and can never exceed
it, and the said progression continued
but in part towards the left hand,
would stand thus, &c. $\frac{1}{729} \quad \frac{1}{243} \quad \frac{1}{81} \quad \frac{1}{27} \quad \frac{1}{9} \quad \frac{1}{3} \quad 1$.

2. But admit the present worth of a
Lease for a certain number of years begi-
ven, some third term must be further
given,

given, let that be the yearly rent, and then you cannot assign the rate; (and the contrary) in this Case to find the rate is one of the most difficult Questions that commonly happens about Annuities, because the Proposition in the 5, 6, (also 4th.) Prop. will not hold conversly, there are but two terms in the Proposition given, which contain but a bare *ratio*, &c. therefore though out of Tables of Forbearance of Money at compound Interest, you can make those for Annuities, yet the converse will not hold.

In this Case you must either by help of the 5 Prop. and common Logarithms, or of Tables of the present worth of Annuities, calculated to the best rate that shall suit the Inheritance, find the present worth of the Number of years proposed according to two rates assumed as near the truth as you can possible, and then if you have not lighted upon the given worth

worth of the years assigned, use the help of this Approximation.

As the difference of the present worths found, is to the difference of the assumed rates of Interest ;

So the difference between the given worth and the truest of those Tryal worths ;

To the difference between the rate of Interest of the tryal worth and that sought.

And when the rate of Interest is truly found, compute accordingly the present worth of the years sought.

But this were to send away the Reader, as if we could in this Case give no answer to the question, by help of the table here used ; whereto I answer, That if the worth of the Inheritance be assigned, repair to the following Proposition.

But if not, let the Casualty as in the 6th. Proposition be reduced to a certainty ; viz. if it concern the Lease of a house which is a Casualty, abridge

the Annual Rent, and then you may by the 5th. *Prop.* cast up the Value of any Number of Years therein.

But herein I would not be misunderstood, as if when a Lease of a House of 1 *l.* yearly for 21 Years is sold for 8 *l.* 10 *s.* the which will purchase an Annuity or Certainty of 14 *s.* 5 $\frac{1}{2}$ *per Annum*, and any Number of years in this Certainty shall be equivalent to as many in that Casualty, that therefore Tables made to both Rates, and a Computation to both the Yearly Rents must needs agree, because all Tables of Annuities are made for Certainties not Casualties.

Or lastly, repair to the first and last *Prop.* and you will there find how to cast up the Amount of 1 *l.* Principal for any time, and at any Rate, where the true manner of such Equations is shewed.

In this second Case is couched two usual Questions, most commoly propounded

pounded without sufficient Limits:
As,

1. When a Lease is sunk by a Fine to a certain Yearly Rent, for a certain term of time, What the whole Lease is worth : Or,

2. What any number of years to be added, after the term in Lease is expired, is worth.

In Order to the Resolution of either of these Questions it must be agreed how much the sunk Rent was, or at least as much given as before was required, and then as before you have a foundation whereon to raise a Rate of Interest, for there is now given the yearly Rent sunk, its present worth, and the time, and the Rate being found, you may then, according as is done in the 5th. Prop. resolve both these Questions.

Prop. 8. *A Table for the forbearance of Money at any Rate of Interest being in store to extend it to serve to all other Rates.*

It was before asserted that any such Table was a Table of Logarithms, and if filled up with Proportionable Numbers (by 1. Prop.) or otherwise suitable to such time or Decimals thereof, as may come in use, might for these purposes be more convenient than those already made, because it would admit a manifold Proof, as also because the differences would not be so vast near the beginning, but in some other respects inferiour thereto. And so contrarily, a Number being assigned to find the Logarithm thereto made, upon any kind of Rate or Supposition, it may easily be done out of the Common Logarithms, for the differences of all Logarithms are either equal

for any Rate of Interest. 39
equal or directly Proportional.

Example first.

As 74108, *Speidells* difference of the Logarithm of 13 and 14.

Is to 32184 *d. Brigs* his difference of those Logarithms ;

So is 16000, *Speidells* difference of the Logarithms of 62 and 63.

To 69487, the difference of those Logarithms in *Mr. Brigs* , or the Common Tables.

Moreover *Van Schooten* in his *Miscellanies* gives you an Account of all Numbers under 1000, that are prime or incompofite, to wit, 1226 in Number, *viz.* the which no other Number will divide , to the which if the differences be first found by Proportion, which in this Case having the two fixt Terms fixed , may be converted into a Multiplication or Division, and that Multiplier or Divisor being Multi-

D 4

plied

plied by all the Digits into an Addition or Substraction, the Logarithms of all the Composite Numbers will easily be made out of the rest, by the continual Addition of the Logarithm of 2, or otherwise.

In the Table here used the time is the Logarithm, and the Amount the Number thereto belonging, and a Proportion accordingly may be applied to any kind of Logarithms, to find the Excess of time above a year, in which a 100 *l.* at 6 *per Centum* did amount to 108 *l.* But it may be more easily thus done.

As ,02530586, the Logarithm of the Amount 1,08.

Is to 1, *viz.* One year the time that 1 *l.* Principal was forborn;

So is ,03342375 the Logarithm of the Amount 1,08.

To 1,32079, the time required, and that is 1 Year, 3 Months, and about 26 Days, and thus the nearest way of resolving

resolving such a Proposition, having the Common Logarithms in Store, is by a Division of the Logarithms: But supposing no such Tables, it may be supplied by two Divisions by help of this Table, which I shall explain in two Cases.

Sect. 1. *The Amount of 1 l. being proposed, to find what time it must be forborn, at 6 per Centum to amount unto as much.*

Divide the given Amount by some Amount in the Table, next lesser, and that Quotient, again by the next lesser Amount, reserving the Quotient.

If the time in the Tables belonging to the two first Divisors, and last Quote be added together, it is the time sought.

Example.

Example.

1 *l.* in a Year at 8 *per Centum* did amount to 1 *s.* .08, in what time at 6 *per Centum*, shall it amount to so much.

Time	In Decimals
Dividend 108	
1. Divisor — 106 — 1 Year	1
Quote — 1,018867 Second Dividend	
2. Divisor — 1,014675 — 3 Months	,25
1,0041	,07079
Quote 26 days <i>ferè</i>	
	<hr/> 1,32079

But

for any Rates of Interest. 43

But to save the Reader this trouble we have added the Equated time for these Rates.

	<i>l.</i>	<i>years</i>
100 <i>l.</i> shall	{ 105 }	{ ,83732
at 6 per	{ 106 }	{ 1
Centum	{ 107 }	{ 1,16114
amount	{ 108 }	{ 1,32079
unto	{ 109 }	{ 1,47896

And by the second Proposition the present worth of fundry payments due hereafter being computed, after the manner of this Example, a true time may be found when the total of all those Payments may equitably be paid at once.

Sect. 2.

Sect. 2. *The Rate of Compound Interest, and the time being given to find what 1 l. Principal did amount to in that time.*

Or rather let it be thus proposed :

How long shall one pound at 6 *per Cent.* be forborn to amount to as much as 1 *l.* forborn any space of time at any other Rate of Interest doth amount unto, and what is the said Amount?

By the time Proposed multiply the Equated time, next before found (in the first Case) that agrees to the Rate proposed, and you have the time sought, and what it shall amount, is found by the first Proposition.

For instance, if 1 *l.* be forborn 18 years at 8 *per Centum*, what shall it amount to?

Or

Or rather thus:

How long shall 1 *l.* at 6 *per Centum* be forborn, to amount to as much, as if the said 1 *l.* had been forborn 18 years at 8 *per Centum*, and what is the said Amount?

By the former Example the Equated time or Logarithm of the *Ratio* found, was,

years
1,3207

This Multiplied by 18, the }
Product is } 23,7726

To wit the time of forbearance.

And the Product of the Interest Sums belonging to the true time is 3,99601 ——— or 3 *l.* 19 *s.* 11 *d.* the Amount of 1 *l.* forborn 18 years at Compound Interest, and the Amount of 1 *l.* being in Store, you see before that thereby all other Questions concerning Annuities are Resolved.

But when the Law settles a New
Rate

Rate of Interest , it may be more speedy to frame a Table thereto , or use such as the Scale of Interest, or other Authors afford. Now what I have hitherto wrote was chiefly to explain the Use of the Table , and to shew, That in case of necessity, with a little more pains, it takes away those Multitudes of Tables that are made, as well for quarterly as yearly Payments, at several Rates for Interest and Annuity Questions, and by reason it, with its Precepts, is contained in one quarter of a sheet of Paper , which I made my constant Companion in my Letter Case , that thou mightest reap the like benefit of it , it is also Printed apart. It is not my intent to inlarge upon a Multitude of Particular Questions , which would all be reduced unto or resolved by some of the former Propositions. That I leave to the Practice of the Studious.

ADVER-

ADVERTISEMENT.

M*ercennus* in the Preface of his *Synopsis Mathematica*, speaking of certain Supplements made to Geometry, and amongst the rest of *Torricello's* Hyperbolical Solid of an infinite length, found equal to a finite *Cylinder*, saith, That a certain Geometer found the like in a Space made by a curved Line drawn through the tops, all right proportional Lines (supposed) and by a right Line, on which the said Proportional Lines stand as Perpendiculars at a like parallel distance from each other; if it may be said to be a Space which is not closed, unless perchance at an infinite distance, which Proportionals, he saith, would

would not long after be published: He wrote it in 1644, but as yet I cannot hear of any such Treatise.

Now, as I said before, the time being the Logarithms, and the Amounts the Proportional Numbers thereto belonging, by the help of the Curved Line he mentions (which may also be described by mean or continual Proportionals in Lines without the help of Numbers) the Logarithmetical Lines of Numbers, Sines, Tangents, Versed Sines, on *Gunter's Rule* may be Graduated, and the Meridian Line of *Mercator's Projection*, or the true Sea Chart (being in the same *Ratio* with the Logarithmetical Tangents) supplied, and whereas he mentions by one Curved Figure, there will also arise another for the same purpose, when the equal parts increasing in Arithmetical Progression, are raised as Perpendiculars on their Proportional Numbers placed in a base Line, and then

then the tops of those Perpendiculars joyned with a flexuous Curved Line passing through them; but the Properties of these Figures as their *Areas* or Contents, Centors of Gravity, round Solids, and their first and second Segments, &c. are not as yet treated of by Geometers, and perchance might be more worthy their Contemplation than divers other Speculations, which seem to be of less Use, to which (amongst many) might be added the Curves made by the Annuity Lines, and the Curve in *Mercator's* Chart that represents a Semi-circle of the great Arch, with a method of discribing it by Points, or Instrument (if possible) from its own Intrinsic Nature, without the help of Calculations or other Projections; also how to cut a Cylinder that the Surface thereof unrolled shall render the Curve proposed of the like Nature, standing upon the Stage of Proposal,

E

have

have troubled all *France* and *Galileus*
for 35 years together, and since his
death received their Resolution.

A Table

A Table of Decimals of Days, which may serve for any Rate of Simple Interest, and a Table of Forbearance, or Amount of 1 l. Compound Interest at 6 l. per Cent. per Annum, for 365 Days and 11 Months.

<i>Days</i>	<i>Decimals of days</i>	<i>Amounts</i>
1	,002739726	1,000159647
2	,005479452	1,000319336
3	,008219178	1,000479037
4	,010958904	1,000638768
5	,013698630	1,000798522
6	,016438356	1,000958305
7	,019178082	1,001118111
8	,021917808	1,001277942
9	,024657534	1,001437800
10	,027397260	1,001597683
11	,030136986	1,001757592
12	,032876712	1,001917526
13	,035616438	1,002077486
14	,038356164	1,002237471
15	,041095890	1,002397482

52 *A Table of Decimals of days.*

<i>Days</i>	<i>Decimals of days</i>	<i>Amounts</i>
16	,043835616	1,002557511
17	,046575342	1,002717580
18	,049315068	1,002877667
19	,052054794	1,003077802
20	,054794520	1,003197919
21	,057534246	1,003358083
22	,060273972	1,003518273
23	,063013699	1,003678488
24	,065753425	1,003938729
25	,068493151	1,003998995
26	,071232877	1,004159285
27	,073972602	1,004319605
28	,076712329	1,004479948
29	,079452055	1,004640310
30	,082191781	1,004800712
31	,084931507	1,004961132
32	,087671233	1,005121577
33	,090410959	1,005282467
34	,093150685	1,005442545
35	,095890411	1,005603068

A Table of Decimals of days. 53

<i>Days</i>	<i>Decimals of days</i>	<i>Amounts</i>
36	,098630137	1,005763616
37	,101369863	1,005924190
38	,104109589	1,006084789
39	,106849315	1,006245414
40	,109589041	1,006406528
41	,112328767	1,006566741
42	,115068493	1,006727443
43	,117808219	1,006888171
44	,120547945	1,007048924
45	,123287671	1,007209703
46	,126027397	1,007370508
47	,128767123	1,007531338
48	,131306849	1,007692194
49	,134246575	1,007853076
50	,136986301	1,008013983
51	,139726027	1,008174916
52	,142465753	1,008335850
53	,145205479	1,008496859
54	,147945205	1,008657870
55	,150684931	1,008817905

54 *A Table of Decimals of days.*

<i>Days</i>	<i>Decimals of days</i>	<i>Amounts</i>
56	,153424657	1,008979967
57	,156164383	1,009141054
58	,158904109	1,009302121
59	,161643835	1,009463306
60	,164383561	1,009624470
61	,167123287	1,009785661
62	,169863014	1,009946877
63	,172602739	1,010108118
64	,175342466	1,010269386
65	,178082192	1,010430680
66	,180821918	1,010591909
67	,183561644	1,010753343
68	,186301369	1,010914719
69	,189041096	1,011076110
70	,191780822	1,011237532
71	,194520548	1,011398513
72	,197260274	1,011560453
73	,200000000	1,011721952
74	,202739726	1,011883485
75	,205479452	1,012045028

A Table of Decimals of days. 55

<i>Days</i>	<i>Decimals of days</i>	<i>Amounts</i>
76	,208219178	1,012206604
77	,210958904	1,012368207
78	,213698630	1,012529835
79	,216438356	1,012691489
80	,219178082	1,012853169
81	,221917808	1,013014874
82	,224657534	1,013176606
83	,227397260	1,013338368
84	,230136986	1,013500145
85	,232876712	1,013661955
86	,235616418	1,013823790
87	,238356164	1,013985650
88	,241095891	1,014147538
89	,243835617	1,014309449
90	,246575342	1,014471385
91	,249315068	1,014633352
92	,252054794	1,014795341
93	,254794520	1,014957357
94	,257534246	1,015119399
95	,260273972	1,015281466

56 *A Table of Decimals of days.*

<i>Days</i>	<i>Decimals of days</i>	<i>Amounts</i>
96	,263013698	1,015443560
97	,265753424	1,015605678
98	,268493150	1,015767824
99	,271232876	1,015929992
100	,273972602	1,016092892
101	,276712320	1,016254415
102	,279452055	1,016416663
103	,282191781	1,016578938
104	,284931517	1,016741243
105	,287671243	1,016993540
106	,290410960	1,017065919
107	,293150695	1,017228295
108	,295890411	1,017396994
109	,298630137	1,017553130
110	,301369863	1,017715585
111	,304109589	1,017878065
112	,306849315	1,018045851
113	,309589041	1,018203108
114	,312328767	1,018365664
115	,315068493	1,018528254

A Table of Decimals of days. 57

<i>Days</i>	<i>Decimals of days</i>	<i>Amounts</i>
116	,317808219	1,018690866
117	,320547945	1,018853504
118	,323287671	1,019016177
119	,326027397	1,019178857
120	,328767123	1,019345733
121	,331506849	1,019504313
122	,334246575	1,019667083
123	,336986301	1,019829875
124	,339726027	1,019991694
125	,342465753	1,020155541
126	,345205479	1,020318411
127	,347945206	1,020481309
128	,350684942	1,020644233
129	,353424667	1,020807182
130	,356164393	1,020970158
131	,358904119	1,021133159
132	,361643845	1,021296189
133	,364383572	1,021461593
134	,367123298	1,021622323
135	,369863024	1,021785425

58 *A Table of Decimals of days.*

<i>Days</i>	<i>Decimals of days</i>	<i>Amounts</i>
136	,372602749	1,021948558
137	,375342476	1,022111715
138	,378082202	1,022274899
139	,380821928	1,022438109
140	,383561654	1,022601344
141	,386301379	1,022764607
142	,389041106	1,022927895
143	,391780832	1,023091208
144	,394520558	1,023254549
145	,397260284	1,023417914
146	,400000000	1,023581308
147	,402739736	1,023744727
148	,405479462	1,023908170
149	,408219188	1,024071642
150	,410958914	1,024235137
151	,413698640	1,024398660
152	,416438366	1,024562213
153	,419178092	1,024725785
154	,421917818	1,024889386
155	,425657544	1,025053613

A Table of Decimals of days. 59

<i>Days</i>	<i>Decimals of day</i>	<i>Amounts</i>
156	,427397270	1,025216666
157	,430136997	1,025380346
158	,432876722	1,025544052
159	,435616448	1,025707783
160	,438356174	1,025871541
161	,441095900	1,026035316
162	,443835626	1,026199125
163	,446575352	1,026362972
164	,449315078	1,026526834
165	,452054804	1,026690723
166	,454794531	1,026854641
167	,457534256	1,027018579
168	,460273982	1,027182546
169	,463013708	1,027346543
170	,465753434	1,027510559
171	,468493161	1,027674605
172	,471232887	1,027838677
173	,473972613	1,028002774
174	,476712339	1,028166899
175	,479452065	1,028331053

60 *A Table of Decimal of days.*

<i>Days</i>	<i>Decimals of days</i>	<i>Amounts</i>
176	,482191791	1,028495226
177	,484931517	1,028659434
178	,487671243	1,028823659
179	,490410969	1,028987914
180	,493150695	1,029152196
181	,495890421	1,029316503
182	,498630147	1,029480838
183	,501369873	1,029645199
184	,504109599	1,029809584
185	,506849325	1,029973997
186	,509589051	1,030138442
187	,512328777	1,030302901
188	,515068503	1,030467393
189	,517808229	1,030631911
190	,520547955	1,030796454
191	,523287681	1,030961026
192	,526027407	1,031125622
193	,528767133	1,031290244
194	,531506859	1,031454895
195	,534246585	1,031619570

A Table of Decimals of days. 61.

<i>Days</i>	<i>Decimals of days</i>	<i>Amounts</i>
196	,536986311	1,031784271
197	,539726037	1,031949000
198	,542465763	1,032137521
199	,545205489	1,032278534
200	,547945215	1,032443342
201	,550684941	1,032608174
202	,553424667	1,032773034
203	,556164393	1,032937920
204	,558904119	1,033102832
205	,561643845	1,033267771
206	,564383571	1,033432736
207	,567123298	1,033597703
208	,569863024	1,033757985
209	,572602756	1,033927789
210	,575342478	1,034092859
211	,578082204	1,034257956
212	,580821929	1,034423079
213	,583561656	1,034588204
214	,586301382	1,034753404
215	,589041108	1,034918606

<i>Days</i>	<i>Decimals of days</i>	<i>Amounts</i>
216	,591780834	1,035083763
217	,594520559	1,035249089
218	,597260286	1,035414370
219	,600000000	1,035579678
220	,602739727	1,035745010
221	,605479453	1,035910371
222	,608219179	1,036075759
223	,610958905	1,036241173
224	,613698631	1,036406611
225	,616438357	1,036572078
226	,619178083	1,036737573
227	,621917809	1,036903089
228	,624657535	1,037068659
229	,627397261	1,037234207
230	,630136987	1,037399804
231	,632876713	1,037565430
232	,635616439	1,037731080
233	,638356165	1,037896757
234	,641095891	1,038062462
235	,643835617	1,038228192

A Table of Decimals of days. 63

<i>Days</i>	<i>Decimals of days</i>	<i>Amounts</i>
236	,646575343	1,038093948
237	,649315069	1,038559733
238	,652054795	1,038725542
239	,654794521	1,038891378
240	,657534247	1,039057241
241	,660273973	1,039223106
242	,663013699	1,039389046
243	,665753425	1,039554988
244	,668293152	1,039720972
245	,671232878	1,039886952
246	,673972604	1,040052974
247	,676712329	1,040219022
248	,679452056	1,040385096
249	,682191782	1,040551198
250	,684931508	1,040717326
251	,687671234	1,040888480
252	,690410959	1,041049661
253	,693150686	1,041215868
254	,695890412	1,041382102
255	,698630138	1,041548363

64 *A Table of Decimals of days.*

<i>Days</i>	<i>Decimals of days</i>	<i>Amounts</i>
256	,701369864	1,041714649
257	,704109589	1,041880960
258	,706849316	1,042047303
259	,709589042	1,042213669
260	,712328768	1,042380062
261	,715068494	1,042546482
262	,717808219	1,042712928
263	,720547946	1,042879401
264	,723287672	1,043045901
265	,726027398	1,043212426
266	,728767124	1,043378979
267	,731506850	1,043545559
268	,734246576	1,043712164
269	,736986302	1,043878797
270	,739726028	1,044045456
271	,742465754	1,044212141
272	,745205480	1,044378853
273	,747945206	1,044545592
274	,750684932	1,044712357
275	,753424658	1,044879150

A Table of Decimals of days. 65

<i>Days</i>	<i>Decimals of days</i>	<i>Amounts</i>
276	,756164384	1,045045969
277	,758904110	1,045212813
278	,761643836	1,045379786
279	,764383562	1,045546585
280	,767123288	1,045713509
281	,769863014	1,045884074
282	,772602740	1,046057440
283	,775342466	1,046214445
284	,778082192	1,046381477
285	,780821918	1,046548536
286	,783561644	1,046710807
287	,786301371	1,046882733
288	,789041097	1,047049872
289	,791780823	1,047217036
290	,794520548	1,047384229
291	,797260275	1,047551448
292	,800000000	1,047718696
293	,802739727	1,047885989
294	,805479453	1,048053264
295	,808219179	1,048220589

66 *A Table of Decimals of days.*

<i>Days</i>	<i>Decimals of days</i>	<i>Amounts</i>
296	,810958905	1,048387941
297	,813698631	1,048555320
298	,816438357	1,048722726
299	,819178083	1,048890158
300	,821917809	1,049057400
301	,824657535	1,049225103
302	,827397261	1,049392616
303	,830136987	1,049560107
304	,832876713	1,049727721
305	,835616439	1,049895336
306	,838356165	1,050062933
307	,841095891	1,050230335
308	,843835617	1,050398261
309	,846575343	1,050565953
310	,849315069	1,050733679
311	,852054795	1,050901432
312	,854794521	1,051020810
313	,857534247	1,051237020
314	,860273973	1,051404858
315	,863013699	1,051572714

A Table of Decimals of days. 67

<i>Days</i>	<i>Decimals of days</i>	<i>Amounts</i>
316	,865753425	1,051738180
317	,868493152	1,051908515
318	,871232877	1,052076452
319	,873972603	1,052244425
320	,876712329	1,052412418
321	,879452055	1,052580440
322	,882191782	1,052748489
323	,884931508	1,052916563
324	,887671234	1,053084180
325	,890410954	1,053252794
326	,893150686	1,053420949
327	,895890412	1,053589108
328	,898630138	1,053757318
329	,901369864	1,053925553
330	,904109589	1,054093831
331	,906849316	1,054262131
332	,909589042	1,054430478
333	,912328768	1,054598766
334	,915068494	1,054767113
335	,917808219	1,054935559

68 *A Table of Decimals of days.*

<i>Days</i>	<i>Decimals of days</i>	<i>Amounts</i>
336	,920547946	1,055103982
337	,923287672	1,055272407
338	,926027398	1,055440912
339	,928767124	1,055609416
340	,931506850	1,055778678
341	,934246576	1,055946508
342	,936986302	1,056115093
343	,939726028	1,056283706
344	,942465754	1,056452343
345	,945205480	1,056621012
346	,947945206	1,056789705
347	,950684932	1,056958443
348	,953424658	1,057127172
349	,956164384	1,057295946
350	,958904110	1,057464748
351	,961643836	1,057633576
352	,964383562	1,057802434
353	,967123288	1,057971313
354	,969863014	1,058140222
355	,972602741	1,058309157

A Table of Decimals of days. 69

<i>Days</i>	<i>Decimals of days</i>	<i>Amounts</i>
356	,975342467	1,058478129
357	,978082193	1,058647110
358	,980821919	1,058816127
359	,983561645	1,058985178
360	,986301371	1,059154242
361	,989041097	1,059323339
362	,991780823	1,059492461
363	,994520549	1,059661616
364	,997260275	1,059837952
365	,1000000000	1,060000000

Months

70 *A Table of Decimals of Months.*

<i>Months</i>	<i>Decimals</i>	<i>Amounts</i>
1	,083333	1,004867
2	,166667	1,009659
3	,250000	1,014675
4	,333334	1,019613
5	,416667	1,024576
6	,500000	1,029564
7	,583334	1,034574
8	,666667	1,039610
9	,750000	1,044671
10	,833334	1,049756
11	,916667	1,054865

*A Table of Forbearance, or Amount of
1 l. at Compound Interest, at 6 l.
per Cent. per Annum for 50 years,
and from thence continued to 100.*

<i>Years</i>		<i>Years</i>	
1	1,06	16	2,540352
2	1,236	17	2,692773
3	1,191016	18	2,854339
4	1,262477	19	3,025599
5	1,338225	20	3,207135
6	1,418519	21	3,399564
7	1,503630	22	3,603537
8	1,593848	23	3,819750
9	1,689479	24	4,048935
10	1,790848	25	4,291871
11	1,898298	26	4,549383
12	2,012196	27	4,821346
13	2,132928	28	5,111687
14	2,260904	29	5,418388
15	2,396558	30	5,743491

72 *A Table of Decimals of Years.*

<i>Years</i>		<i>Years</i>	
31	6,088108	46	14,590486
32	6,453386	47	15,465915
33	6,840589	48	16,393869
34	7,250025	49	17,377502
35	7,686087	50	18,420152
36	8,147252	60	32,987488
37	8,636087	70	59,075911
38	9,154252	80	105,795933
39	9,703507	90	189,464433
40	10,285715	100	339,398871
41	10,902857		
42	11,557032		
43	12,250453		
44	12,985481		
45	13,764609		

The

The Doctrine of
DECIMAL ARITHMETICK,
 Simple Interest, &c.

AS ALSO

Of Compound Interest and Annuities:

Generally performed for any time of
 Payment, or Rate of Interest, by help
 of any particular Table of Forbearance
 of 1 l. Principal.

Abridged for Portability in a Letter Case.

By *John Collins* Accomptant, *Philomath.*

A *Decimal Fraction* is such a one
 whose Denominator is under-
 stood and not expressed; and is an
 Unit with as many Cyphers following
 G it,

74 *Doctrine of Decimal Arithmetick.*

it, as there are Figures and Cyphers in the Numerator.

Corollary. Wherefore the annexing of Cyphers towards the right hand of a Decimal alters not its value. A Decimal Fraction of Coin may be easily valued without the help of Tables. For each Unit in the first place is in value 2 s. 5 d. in the second place 1 s. and the rest Farthings; but if any exceed $\frac{25}{48}$ there must be $\frac{1}{2}$ Farthings abated :

	,854	17 s. 1 d.
So	is in value	
	,418	8 4 $\frac{1}{2}$.

Addition and Subtraction in Decimals is the same as in whole Numbers, keeping the place of Units under each other.

Multiplication in Decimals; as many Decimal parts as are in both Multipliers, so many must be cut off from the

the Product ; which if it have not so many places the Defect is to be supplied with Cyphers towards the left hand.

Division in Decimals is the Converse annex Cyphers sufficient (if need be) to the Dividend towards the right hand, that it may have more Decimal Parts than the Divisor, then as many Decimal Parts as are in the Dividend, so many must be in the Divisor, and Quote, when the Division is finished; and in case of defect, the Quote is to be supplied with Cyphers towards the left hand.

Simple Interest.

Prop. 1. To compute the Interest of
1 l. for a Day.

$\frac{6}{365}$ is the Interest of 100 l. for a day, the $\frac{1}{100}$ whereof is the Interest of 1 l. for a day, viz. $\frac{6}{36500}$, Or 6 divided by 36500, namely,

G 2

Days

<i>Days</i>	<i>Interest of 1 l.</i>
1	,000164384
2	,000328768
3	,000493152
4	,000657536
5	,000821920
6	,000986304
7	,001150688
8	,001315072
9	,001479456

Prop. 2. Forbearance of Money at Simple Interest.

The Interest of one pound for any number of Days may be taken from this Table by Addition, (instead of a Multiplication, by the number of days, the trouble whereof is by the help of this Table spared) and that
Product

Product multiplied by any other given Sum, makes the Interest thereof for the time given.

Prop. 3. *Rebate, or the present worth of Money due hereafter.*

Find the Interest of one pound, for the time given, and thereto adding an Unit. By it divide any other Sum given, and the Quote is its present worth.

Prop. 4. *Equation of Payments.*

By Prop. 3. Compute all the present worths, and then by Proportion. If all those present worths amounted to the Total of all those Payments, What did 1 *l.* amount to in the said time? From the Result subtract an Unit, the Remainder is the Interest of 1 *l.* for the time sought, which divide by the Interest of 1 *l.* for a day, the

the Quote is the number of days fought. If you are to Equate an Annuity at Simple Interest, I presume a *Compendium* may be found in *Mengolus* his Arithmetical Quadratures, (a Book I never saw) who its probable by a *Compendium* gets the Fact of an Arithmetical Progression, and adds Fractions that have a constant Numerator, and an Arithmetical Progression for their Denominators.

Days	Decimals	Amount	Years	Amounts
1	,002739	1,000160	1	1,06
2	,005479	1,000319	2	1,1236
3	,008219	1,000479	3	1,191016
4	,010959	1,000639	4	1,262477
5	,013698	1,000798	5	1,338225
6	,016438	1,000958	6	1,418519
7	,019178	1,001118	7	1,503630
8	,021918	1,001278	8	1,593848
9	,024657	1,001438	9	1,689479
10	,027397	1,001598	10	1,790848
11	,030137	1,001757	11	1,898298
12	,032877	1,001917	12	2,012196
13	,035617	1,002077	13	2,132928
14	,038357	1,002237	14	2,260904
15	,041097	1,002397	15	2,396558

Simple Interest.

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Days	Decimals	Amounts	Years	Amounts
16	,043837	1,002557	16	2,540352
17	,046577	1,002717	17	2,692773
18	,049316	1,002878	18	2,854339
19	,052055	1,003038	19	3,025599
20	,054795	1,003198	20	3,207135
21	,057536	1,003358	21	3,399564
22	,060274	1,003518	22	3,603537
23	,063016	1,003678	23	3,819750
24	,065755	1,003839	24	4,048935
25	,068495	1,003999	25	4,291871
26	,071233	1,004159	26	4,549382
27	,073973	1,004319	27	4,822346
28	,076714	1,004480	28	5,111687
29	,079454	1,004640	29	5,418388
30	,082193	1,004801	30	5,743491
60	,164386	1,009625	31	6,088101
90	,246579	1,014472	32	6,453386
120	,328772	1,019342	33	6,840589
150	,410965	1,024335	34	7,250025
180	,493158	1,029153	35	7,686087
210	,575351	1,034093	36	8,147252
240	,657544	1,039057	37	8,636087
270	,739737	1,044045	38	9,154252
300	,821930	1,049057	39	9,703507
330	,904193	1,054093	40	10,285715
360	,986316	1,059154	50	13,420152
Mo. 1	,083334	1,004867	60	32,987388
2	,166667	1,009759	70	59,075911
3	,250000	1,014674	80	105,795933
6	,500000	1,029563	90	189,464433
9	,750000	1,044671	100	339,398471

The

The annexed Table is a Table of the Forbearance or Amount of 1 *l.* at Compound Interest at 6 *per Cent. per An.* This Table as to the Years, is composed by the continual Multiplication of 1,06 (or by Addition tabulating the same) and as to the Days may be supplied either by continual Proportionals, or the common Logarithms, which also are no other than Answers to Interest Questions, at the rate of near 26 *per Cent.* (or the Amount is as 1, to 1,2589292) supposing 1 *l.* in 10 Years to amount to 10 *l.* the Logarithms (distinguishing the first Figure with a Comma) shew the Years and Decimals when it amounted to 2 *l.* 3 *l.* &c. And those Logarithms may be raised from the former. For the differences of all sorts of Logarithms of any four Numbers, are directly Proportional, and may be raised from any Table of Forbearance of Money at Compound Interest.

Prop. 1.

Prop. 1. *To continue the said Table, or to find the Amount of 1 l. forborn for any time proposed.*

Multiply those Amounts together that belong to such time, as added together makes the time given.

Prop. 2. *The Amount of 1 l. being given, To find the time of Forbearance.*

Search the Amount in the Tables, and divide by the next lesser amount, and that Quote again by the next lesser Amount, &c. reserving the Quotes, the time belonging to the Divisors, and the last Quote is the time sought. *Example, 1 l. did amount to 1,08 in 1,32079 years.*

Prop. 3. *To compute the Amount of 1 l. for any time at any Rate of Interest.*

By Prop. 2. compute in what time at 6 per Cent. 1 l. shall amount to as much as in one Year at the Rate proposed, that keep in store, and multiply by the time proposed, the Fact is the time in which at 6 per Cent. 1 l. shall amount to as much as it should do at the other Rate given; to know which, use Prop. 1.

Example, 100 l. did amount to 105 l.
in ,83732 Years.

Or, 1 l. did amount to	}	1,05	In Years	}	,83732
		1,06			1,
		1,07			1,16114
		1,08			1,32079
		1,09			1,47896
		1,10			1,63569
					Admit

Simple Interest. 83

Admit it were required to find what 1 *l.* amounted to in 20 Years at 8 per cent. multiply 1,32079 by 20, the Fact or Product is 26,14158, and by *Prop.* 1. 1 *l.* at 6 per cent. in that time did amount to 4,6609.

Now if the Amount of 1 *l.* be given, Annuity Problems are solved thereby. And for the advantage of this Proposition the Decimals of time were added.

Prop. 4. Forbearance of Monies at Compound Interest.

As an Unit is to its Amount in the Tables suitable to the time given :

So is any other Sum to its Amount.

Prop. 5. Discount of Money at Compound Interest, the Converse of the former.

As the Tabular Number,

H 2

Is

Is to an Unit, its present Worth :
 So is any other Sum,
 To its present Worth.

In Annuity Questions the Proportions are suited for yearly Payments ; if the Payment be half-yearly , then instead of ,06 (or 1,06) and the Annuity in any term , take half a years Interest ,029565, and the half yearly Payment ; and for quarterly Payments the Quarters Interest ,014674, and the quarterly Payment, &c.

Prop. 6. Forbearance of Annuities.

As ,06 the Annual Interest of 1 £.
 Is to the Amount less an Unit of
 1 £. forborn any term :

So is the Annuity or yearly Pension,

To the Sum for the whole Arrears thereof.

Prop. 7. *Discount of Annuities, or
their present Worth.*

As the Fact of ,06 and of the Amount of 1 *l.* at Compound Interest for the time proposed,

Is to the said Amount less an Unit:

So is any Annuity,
To its present Worth.

To this Proposition belongs the Purchase of the Fee-simple.

For { yearly Payments { 1 l. } by the { ,06 } the { 16, ²/₃ }
 { half-yearly divide the { ,5 } Inte- { ,0295613 } Quotes { 16,91303 }
 { quarterly Rent { ,25 } rest { ,01674 } are { 17,97843 }

And

And so many pounds (or years purchase) is the Inheritance worth (as may be proved from *Tacquet's Arithmetick*) which Sums are no other than the Totals of the present Worths of the infinite Payments to be made. Hereto also belongs Equation of Payments at Compound Interest: for having computed the present Worths, by proportion, you may find what 1 *l.* amounted to in the time sought, and by the second Proposition the time it self.

Prop. 8. *To find what Annuity any Sum of ready Money shall purchase for any time proposed.*

As the Amount less an Unit of 1 *l.* forborn at Compound Interest, the time proposed,

Is to the Fact of .06, and of the Amount of 1 *l.* so forborn:

So is any Sum of ready Money,

H 4

To

To the Annuity it shall purchase.
 From these three Propositions the
 Tables in common use may be raised,
 if you put an Unit in the third place.

Prop. 9. The Worth of an Annuity being proposed, To find the time of its Continuance.

Get the difference of the Facts of
 1,06 into the Annuity,

And of ,06 into the Sum of the
 present Worth and Annuity,

Then , as the said difference, is to
 an Unit :

So is the Annuity, To the Amount
 of 1 *l.* for the time sought (to be
 found by the second Proposition.)

Prop. 10. An Annuity, its present Worth, and time of Continuance proposed, To find the Rate of Interest.

This is the hardest of Annuity Problems,

blems, and not to be resolved with Logarithms without Position or Trials; the use is to find the value of any other Number of Years therein: To facilitate which, observe, That by *Prop. 8.* for 21 years at 6 *per Cent.* you may purchase Annuity of

s.	d.		l.	s.
11	11	} For {	7	00
12	9		7	10
13	7		8	00
14	5		8	10
15	3 $\frac{1}{2}$		9	00
17			10	00

And these are the Rates for Leases of Houses of such a time, to wit, 1 *l.* a year for 21 years, is worth about 7 *l.* 10 *s.* or 8 *l.* as men agree, which is a certainty of 12 *s.* 9 *d.* or 13 *s.* 7 *d.* *per Annum*, whereby you have a direction to accord an abate for Casualty, and then use the 6 Proposition.

Most

Most of the many Propositions in the Learned Doctor *Wallis* his Arithmetick concerning Geometrical Progression; as also in Mr. *Dary's* sheet of *Algebra*, may be easily resolved by help of the former Table: But this I have handled in my Supplements to Accomptantship, where also somewhat of Logarithm Curves, derived from Mean or Continual Proportionals, or Tables of Interest, and serve for making the Logarithm Scales of Numbers, Sines, Tangents, (or *Mercator's* Meridian Line) Geometrically.

Prop. 9. *More easily.*

As on Annuity, less the Fact of ,06
into its present Worth,

Is to the Annuity :

So is an Unit,

To the Amount of 1 *l.* for the time
sought.

If the Payments be half yearly, for
the Annuity in the first and third
Terms,

Simple Interest.

91

Terms, take half the Annuity, and for ,06 in the first Term as a Multiplier, take ,02956 the half Years Interest.

For another Rate of Interest as 8 per Cent. take in ,08 as a Multiplier, and find the time in Years and Decimals by 2. Prop. as at 6 per Cent. which divide by the fitted Number of the Rate in Prop. 3. to wit 1,32079, the Quote is the true time sought in Years and Decimals, which is easily reduced into Days by the Decimal Table of Days.

Example.

50 l. a Year at 8 per Cent. is worth 490 l. 18 s. 2 $\frac{1}{2}$, or 490,91, the time of continuance is 20 years.

$$\begin{array}{r} 490,91 \\ ,08 \end{array} \left. \vphantom{\begin{array}{r} 490,91 \\ ,08 \end{array}} \right\} \text{facit } \begin{array}{r} 50 \\ 39,2728 \\ \hline 10,7275 \\ \text{Divisor} \end{array} \begin{array}{l} \text{Dividend} \\ 50 \text{ (Quote } 4,6609 \end{array}$$

An

An Amount is proposed for 20 years to be 4,6609, what is the Rate of Interest?

1. The time in which 1 *l.* came to so much at 6 *per Cent.* is $26,4158$, found by the second Proposition.

2. Divide $26,4158$ by 20, the time proposed, the Quote is 132079 years.

3. 1 *l.* at 6 *per Cent.* in that time amounted to 1,08, the *Ratio* sought.

A

PERPETUAL ALMANACK,

*To find what day of the Week the first
of March shall happen upon.*

ADD to the Number 2 the Year
of our Lord, and the fourth
part of that, neglecting the odd, and
divide by 7, the Remainder is the day
of the Week; but if none remains it
is Saturday, for you must account
from Sunday, Munday, &c.

Example.

The Number ——— 2

The Year of our } 1685
Lord, 1683.

The fourth Part ——— 421

Divisor ——— 7) 21 08

0 07) 301

Remainder 1

Example.

So that the First of
 March is the First
 [Day, that is, Sun-
 day.

*To find on what day of the Week any
Day of any Month in the said Year
hapneth.*

To perform this Proposition, the
following Verse being in Effect a Per-
petual Almanack, is to be kept in Me-
mory.

March 1 April 5 May 3 June 7 July 5 August 2 Sept. 6

An English Courage great Events brings forth,

October 4 November 1 December 6 January 3 February 7

Dunkerk's astonish'd, seeing Charles's Growth.

In

In this Verse are twelve Words relating to the Number of the twelve Months of the Year, accounting *March* the First; wherefore the word proper to that Month, is *An*, and so in order of the Alphabet, which will never exceed Seven; and the Number of the said Letter shews what day of the Month proper to the said word shall be the same day of the Week the First of *March* happ'ned upon, as the Example above.

*To find the Prime or Golden Number
and Epact.*

Add to the Number 1 the Year of our Lord, and divide by 19, the remainder gives the Prime. Multiply the Prime by 11, and divide by 30, gives the Epact.

A Table

*A Table of Primes or Golden Numbers
and Epacts for ever.*

P	1	2	3	4	5	6	7	8	9	10
E	11	22	3	14	25	6	17	28	9	20

P	11	12	13	14	15	16	17	18	19
E	1	12	23	4	15	26	7	18	29

To find Easter for ever.

Subtract the Epact (if less than 28 or 29) from 47, if the Epact be 28 or 29 from 77, the remainder is Easter limits; so the first Sunday after the remainder, beginning from *March*, is Easter Sunday.

To find the Age of the Moon.

Add to the Epact the Day of the Month, and so many more as there
I are

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are Months from *March* (accounting *March* one) the Sum if less than 30 is the Moon's Age (if more) Substract 30, (when 31 Days in the Month) but if 30 Days or less, Substract 29, the Remainder is the Moon's Age.

To find the Southing of the Moon, and High Water at London-Bridge.

Multiply the Moon's Age by $\frac{8}{10}$ shews the Southing, to which add 3 hours, shews High-water at *London-Bridge*.

To find it another way.

Multiply the Moon's Age by 4, and divide by 5, the Quotient shews it, every Unit that remains is in value 12' Minutes, at full Moon reject 15 from it. Add to this 3 hours, shews High-water at *London-Bridge*.

To

To find what Day of the Month the Sun enters into any Sign of the Zodiack, by the following Verse.

Aries	Taurus	Gemini	Cancer	Leo	Virgo
♈	♉	♊	♋	♌	♍
Evil	attends	its	Object,	unvail'd	Vice,
Libra	Scorpio	Sagittar.	Capricorn	Aquar.	Pisces.
♎	♏	♐	♑	♒	♓
Vain	Villains,	jest	into	a	Paradise.

In which are twelve Words to represent the twelve Months of the Year, the first *March*, the second *April*, &c. and over the respective Words are the Characters of the twelve Signs of the Zodiack, thereby denoting, that in the Month to which the Word belongs, the Sun is in that Sign overhead: And if it be required to know the day of the Month in which the Sun enters into any of those Signs; if the first Letter of the Word, pro-

per to the Month, be a Consonant, the Sun enters into the Sign thereto belonging on the eighth Day of the said Month, as in the Word Paradise, belonging to *February*, in that Month he enters *Pisces* the eighth Day; but if it be a Vowel, as all the rest are, add so many Days unto eight, as the Vowel denotes; now the Vowels are but five in Number.

To know in what Degree of the said Sign he is for any other Day.

If the Number of the Day of the given Month exceed the Number of that Day in which the Sun enters into any Sign, Subtract the lesser from the greater, and the Remainder is the Degree.

Example.

On the 21 of *April* I would find
the

the Sun's place by the Verse. It appears the Sun enters into *Taurus* on the ninth of that Month, which taken from 21, there remains 12, shewing that the Sun is in the 12 Degree of *Taurus*, the second Sign.

2. But if the Number of the Day of the given Month be less than the Number of that Day in which the Sun enters into the beginning of any Sign, the Sun is not entred into the said Sign, but is still in the Sign belonging to the former Month. In this Case Subtract the given Day, from the Day of his Entrance into the next Sign, and again Subtract the Remainder from 30, and the Remainder shews his place in the Sign of the former Month.

Example.

Let it be required to know the Sun's place the fifth of *August* on the
thirteenth

thirteenth day of the Month the Sun enters into *Virgo*, 5 from 13 rests 8, and that taken from 30 there remains 22, shewing that the Sun is in the 22 degree of *Leo*, the fifth Sign.

F I N I S.

as. 06 of Int^r: of 1st for 1st lo of
Compound Int^r of 1st for 1st time
proposed or lo of ann^{ty} of 1st lo of
By 1. So in any other